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(54) **VALVE DEVICE, PARTICULARLY A VENTILATION VALVE FOR THE VENT PIPE OF A VEHICLE FUEL TANK.**

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Description

The present invention relates to a valve device according to the introductory portion of claim 1.

A valve of this type is used as a so-called "roll-over" valve in the vent pipe between a vehicle fuel tank and a filter with activated charcoal, which is designed to absorb gasoline fumes from the tank. The valve is designed to prevent liquid gasoline from reaching the filter should the inclination of the vehicle exceed 30°, for example, since liquid gasoline impairs the capacity of the charcoal to absorb gasoline fumes.

When filling the tank, some of the venting normally takes place via the gap between the gasoline pump nozzle and the tank fill pipe. If this gap is closed for the purpose of entirely preventing gasoline fumes from leaking out into the surrounding air, the entire volume of gas which is pressed out of the tank when it is filled with fuel must pass through the activated charcoal filter. Normally, when the tank is completely filled, the pump nozzle automatically shuts off the supply of fuel and prevents overfilling, but it is important that this automatic shut-off be effected quickly so that fuel does not rise in the vent pipe and reach the filter. If there is a seal between the nozzle spout and the tank fill pipe, then some form of safety device is required to protect against fuel penetrating the filter. This protection can be in the form of a float operated valve.

From US-A-3765435 there is known a valve device which combines the function of a "roll-over" valve and a float operated valve in a single, simple and reliable valve.

This valve has a valve closing member which is displaceably supported by a float, such that as the liquid level rises in the housing the float lifts the valve closing member towards its closed position. A ball cooperates with the valve closing member in such a manner that, when the housing is filled with liquid and has been turned 180° from the predetermined position, the ball holds the valve closing member in its closed position.

When filling the tank with fuel, a mixture of air and fumes flow out from the tank via the vent pipe. As soon as the tank is full, fuel rises in the vent pipe. If the filling is done relatively slowly, the float follows the rising of the liquid level in the valve housing and the valve closes without any liquid having forced its way through the valve outlet. If, however, the tank is filled rapidly, there is a "pressure surge" in the fuel, when the tank has been filled, and the float cannot close the valve quickly enough to prevent a certain amount of fuel from passing through the valve and reaching the filter.

The purpose of the present invention is to obtain a valve device according to the preamble of claim 1 which makes sure also that the valve closes when there is such a fuel pressure surge. This is obtained by means of valve device having the characterizing features of claim 1.

The invention will be described in more detail with reference to an example shown in the accompanying drawing, which shows a partially cut-away side view of a combined float and "roll-over" valve, according to the invention.

In the Figure, 1 generally designates a valve housing, consisting of a lower housing portion 2 and an inlet stub 3, intended to be connected to a vent pipe from a fuel tank, and an upper housing portion 4 with an outlet stub 5, intended to be connected to a charcoal filter. The inlet stub 3 has a cylindrical extension 6 which extends into the housing portion 2 and has four evenly distributed openings 7, through which gas or liquid can flow into the valve housing. A valve closing member 8 consists of a disc-shaped sealing portion 9 and a cylindrical portion 10 extending downwards therefrom, which is vertically displaceable in the housing. The cylindrical portion 10 is guided by the cylindrical extension 6 and carries on its outer surface an annular float 11.

In the position shown, the valve is open, i.e. the valve closing member 8 is in a lower end position, in which a sealing ring 12 on the valve disc 9 is spaced from a conically shaped valve seat 13 in the housing portion 4. The underside of the valve disc 9, which is made with a conical depression 14, rests in this position on a ball 15, which in turn rests in a conical depression 16 in a plunger element 17, which is slideably mounted in the cylindrical extension 6. The plunger element 17 is a homogeneous metal body to provide a relatively heavy weigh. It has an upper shoulder, which in the rest position shown rests on the upper edge of the cylinder 6.

With the moveable components of the valve assuming the positions shown in the Figure, this occurring when the inlet 3 and the outlet 5 are vertically aligned and the valve housing is empty of liquid, gases can pass through the valve thus venting the fuel tank as it is filled. If fuel should penetrate into the valve housing, the valve closing element 8 will be lifted by the float 11, so that the sealing ring 12 of the valve disc will be pressed against the valve seat 13 thus closing the valve. This presupposes that the liquid level rises relatively slowly in the valve housing. If the fuel thank is filled rapidly, the fuel will surge through the vent pipe when the tank is completely filled. The openings 7 in the cylinder 6 serve in this case as constrictions and the plunger 17 will be subjected at its lower end surface to an upwardly directed force caused by a rapid pressure surge in the space below the plunger 17. This results in the plunger rapidly lifting the valve closing member 8 to a closed position. This process is substantially more rapid than closing by the effect of the float alone. When the valve has been closed and the pressure equalized on either

side of the plunger due to the valve housing being filled with fuel, the plunger 17 returns to its starting position and the valve is kept closed by the float 11 as long as there is fuel in the valve housing.

When the valve housing 1 is tipped from its position shown, the ball 15 rolls out (up) towards the edge of the conical depression 16, thus lifting the valve closing member 8 towards the valve seat 13, whereby the valve is completely closed, for example when the angle of tilt exceeds 30°. By virtue of the fact that the valve disc 9 also has a conical depression 14 on its underside, against which surface the ball rolls, a double lifting height is obtained compared with the case with a valve disc with a flat underside.

If the valve is turned over 180° from the position shown, meaning that the car has come to rest upside down, the valve closing member 8 is loaded by the combined weight of the ball 15 and the plunger 17. Their masses are selected so that the float 11, under the influence of fuel flowing into the valve housing, is not able to lift the valve body from the closed position, i.e. the combined weight of the valve closing member 8, the ball 15 and the plunger 17 is greater than the lifting force of the float 11.

The plunger element 17 thus has a double function. It serves on one hand as an "emergency" valve closing device actuated by a pressure surge and, on the other hand, as its weight helps to counteract the lifting force of the float 11 when the valve is turned upside down.

Claims

1. Valve device, comprising a valve housing (1) with an inlet (3) and an outlet (5), a valve seat (13) and a valve closing member (8) movable in said housing between open and closed position of the valve closing member (8) is in contact with the valve seat to prevent liquid from flowing through the outlet, said valve closing member interacting with a ball (15) which at a certain tilting of the valve housing, relative to a predetermined position, move the valve closing member to its closed position, said valve closing member cooperating with a float (11), which, as the liquid level rises in the housing (1) in its predetermined position, lifts the valve closing member towards its closed position, **characterized** in that said ball (15), which interacts with said valve closing member (8), is coordinated with a movably mounted plunger element (17), being guided and supported by an extending portion (6) of the valve housing (1), said plunger element (17) being disposed at a certain liquid flow through the inlet (3) to lift the valve closing member to its closed position, and in that the combined weight of the valve closing member (8), the ball (15) and the plunger element (17) is greater than the lifting force of the float (11) being fixed to the valve closing member (8), so that the valve closing member, when the housing is filled with liquid and has been turned to an upside down position, is held in its closed position.

2. Valve device according to claim 1, **characterized** in that the plunger element (17) forms a seat (16) for the ball (15), on which the valve closing member (8) rests, and that said seat is formed so that the ball lifts the valve closing member towards the valve seat (13), when the valve housing (1) is tipped from its predetermined position.

3. Valve device according to Claim 1 or 2, **characterized** in that a pipe stub (6) extending into the valve housing (1) forms the guide for the plunger element (17) and has at least one opening (7), through which gas or liquid can flow into the valve housing, the flow-through area of which is adapted to the effective area of the plunger element, so that the plunger element is lifted towards the valve seat, when there is a certain inlet flow.

4. Valve device according to Claim 2 or 3, **characterized** in that the seat of the ball (15) is formed by a conical depression (16) in an upward surface of the plunger element (17) and that the valve closing member (8) has on its side facing the ball a conical depression (14), into which the ball extends.

Patentansprüche

1. Ventilanordnung mit einem Ventilgehäuse (1) mit einem Einlaß (3) und einem Auslaß (2), einem Ventilsitz (13) und einem Ventilschließteil (8), das im Gehäuse zwischen einer offenen und einer geschlossenen Stellung des Ventilschließteils (8) bewegbar ist, wobei das Ventilschließteil in der geschlossenen Stellung mit dem Ventilsitz in Berührung ist, um Flüssigkeit daran zu hindern, durch den Auslaß zu fließen, wobei das Ventilschließteil mit einer Kugel (15) zusammenwirkt, die bei einer bestimmten Neigung des Ventilgehäuses, relativ zu einer vorbestimmten Stellung, das Ventilschließteil (8) in seine geschlossene Stellung bewegt und wobei dieses Ventilschließteil (8) mit einem Schwimmer (11) zusammenwirkt, der dann, wenn das Flüssigkeitsniveau im Gehäuse (1) in eine vorbestimmte Stellung ansteigt, das Ventilschließteil in Richtung auf seine geschlossene Stellung anhebt, dadurch **gekennzeichnet,**
daß die Kugel (15), die mit dem Ventilschließteil (8) zusammenwirkt, mit einem beweglich montierten Plungerelement (17) zusammengefaßt ist,

das durch ein vorstehendes Teil (6) des Ventilgehäuses (1) geführt und gelagert ist, wobei das Plungerelement (17) so ausgebildet ist, daß es bei einer bestimmten Flüssigkeitsströmung durch den Einlaß (3) das Ventilschließteil in seine geschlossene Stellung anhebt und
daß das zusammengefaßte Gewicht des Ventilschließteiles (8), der Kugel (15) und des Plungerelementes (17) größer ist als die Hubkraft des Schwimmers (11), der am Ventilschließteil (8) befestigt ist, so daß das Ventilschließteil dann, wenn das Gehäuse mit einer Flüssigkeit gefüllt ist und wenn seine Oberseite nach unten gedreht wird, in seiner geschlossenen Stellung gehalten wird.

2. Ventilanordnung nach Anspruch 1, dadurch gekennzeichnet, daß das Plungerelement (17) einen Sitz (16) für die Kugel (15) bildet, auf dem das Ventilschließteil (8) aufsitzt und daß dieser Sitz so ausgebildet ist, daß die Kugel das Ventilschließteil dann in Richtung des Ventilsitzes (13) anhebt, wenn das Ventilgehäuse (1) aus seiner vorbestimmten Stellung geneigt wird.

3. Ventilanordnung nach einem der Ansprüche 1 oder 2, dadurch gekennzeichnet, daß ein Rohrstutzen (6), der sich in das Ventilgehäuse (1) hinein erstreckt, die Führung für das plungerelement (17) bildet und wenigstens eine Öffnung (7) hat, durch die Gas oder Flüssigkeit in das Ventilgehäuse strömen kann, wobei der Strömungsquerschnitt an den wirksamen Bereich des Plungerelementes so angepaßt ist, daß das Plungerelement dann in Richtung des Ventilsitzes angehoben wird, wenn eine bestimmte Einlaßströmung vorhanden ist.

4. Ventilanordnung nach einem der Ansprüche 2 oder 3, dadurch gekennzeichnet, daß der Sitz der Kugel (15) durch eine konische Vertiefung (16) in der Oberseite des Plungerelementes (17) gebildet wird und daß das Ventilschließteil (8) an derjenigen Seite, die auf die Kugel zu gerichtet ist, eine konische Vertiefung (14) aufweist, in die sich die Kugel hinein erstreckt.

Revendications

1. Dispositif de vanne, comprenant un boîtier (1) de vanne muni d'un orifice d'entrée (3) et d'un orifice de sortie (5), un siège (13) de vanne et un organe (8) de fermeture de vanne, déplaçable dans le boîtier entre une position d'ouverture et de fermeture de l'organe (8) de fermeture de vanne, est en contact avec le siège de vanne pour empêcher la circulation de liquide à travers l'orifice de sortie, l'organe de fermeture de vanne coopérant avec une bille (15) qui sous l'effet d'un certain basculement du boîtier de vanne, par rapport à une position prédéterminée, déplace l'organe de fermeture de vanne vers sa position de fermeture, l'organe de fermeture de vanne coopérant avec un flotteur (11) qui, lorsque le niveau de liquide monte dans le boîtier (1) dans sa position prédéterminée, lève l'organe de fermeture de vanne vers sa position de fermeture, caractérisé en ce que la bille (15), qui coopère avec l'organe (8) de fermeture de vanne, est coordonné avec un élément de plongeur (17) monté déplaçable, guidé et supporté par une partie (6) de prolongement du boîtier (1) de vanne, l'élément de plongeur (17) étant disposé pour lever l'organe de fermeture de vanne vers sa position de fermeture pour un certain débit de liquide à travers l'orifice d'entrée (3), et en ce que le poids combiné de l'organe (8) de fermeture de vanne, de la bille (15) et de l'élément de plongeur (17) est supérieur à la force de levage du flotteur (11) fixé à l'organe (8) de fermeture de vanne, de manière que l'organe de fermeture de vanne, lorsque le boîtier est rempli de liquide et a été tourné dans une position renversée de haut en bas, est maintenu dans sa position de fermeture.

2. Dispositif de vanne selon la revendication 1, caractérisé en ce que l'élément de plongeur (17) forme un siège (16) pour la bille (15), sur lequel l'organe (8) de fermeture de vanne est disposé, et en ce que le siège est formé de manière que la bille lève l'organe de fermeture de vanne vers le siège (13) de vanne, lorsque le boîtier (1) de vanne est basculé depuis sa position prédéterminée.

3. Dispositif de vanne selon la revendication 1 ou 2, caractérisé en ce qu'un tronçon (6) de conduit s'étendant dans le boîtier (1) de vanne forme le guide pour l'élément de plongeur (17) et comporte au moins une ouverture (7), à travers laquelle du gaz ou du liquide peut s'écouler dans le boîtier de vanne, la section d'écoulement de celui-ci est adaptée à la section effective de l'élément de plongeur, de manière que l'élément de plongeur est levé vers le siège de vanne, lorsqu'il existe un certain débit à l'orifice d'entrée.

4. Dispositif de vanne selon la revendication 2 ou 3, caractérisé en ce que le siège de la bille (15) est formé par un enfoncement (16) conique ménagé dans une surface supérieure de l'élément de plongeur (17) et en ce que l'organe (8) de fermeture de vanne comporte sur son côté faisant face à la bille un enfoncement (14) conique dans lequel la bille s'étend.